Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **14MA2018** | **Duration :** | **3hrs** |
| **Sub. Name :** | **OPERATIONS RESEARCH - II** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | A tyre manufacturer has to supply 12000 tyres per year to an automobile industry. The demand is fixed and known. Shortage cost is assumed to be infinite. The inventory holding cost is Rs.0.15/month and the setup cost per run is Rs.325. Determine the following:  i) The optimum run size, ii) Optimum scheduling period  iii) Minimum total expected yearly cost. | CO1 | 10 |
| b. | Explain the steps in ABC analysis of inventory. | CO1 | 5 |
| c. | Write the classifications and functions of inventory. | CO1 | 5 |
| **(OR)** | | | | |
| 2. | a. | The demand for a computer monitor cable is 1050 cables per month and shortages are allowed. If the cost per cable is Rs.125, cost of making one purchase is Rs.700, the holding cost of one cable is Rs.3 per year and cost of one shortage is Rs.50 per year. Determine the following:  i) Optimum purchase quantity ii) Optimum number of shortages  iii) Optimum total yearly cost iv) Number of orders per year  v) Time between order vi) Maximum inventory. | CO1 | 12 |
| b. | A machine tool manufacturing company has a demand for oil seals at the rate of 15000 oil seals/year. It can produce 2500 oil seals per month. The cost of one setup is Rs.550 and the inventory holding cost is Rs.0.25/oil seals/month. The cost per oil seal is Rs.5. Determine:  i) Optimum lot size ii) Maximum inventory  iii) Total time iv) Total cost per year | CO1 | 8 |
|  |  |  |  |  |
| 3. | a. | The activities involved in a project with their respective time estimates are given in the table (in weeks)   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Activity** | **1-2** | **1-3** | **2-3** | **3-4** | | to | 1 | 2 | 2 | 3 | | tm | 1 | 5 | 2 | 6 | | tp | 7 | 14 | 14 | 15 |   i) Find the expected duration and variance and standard deviation of the project.  ii) What is the probability that the project will be completed atleast 2 weeks later than expected?  iii) What is the probability that the entire project is not completed in 11 weeks?  iv) What is the probability of completing the project in 12 weeks? | CO1 | 16 |
|  | b. | Explain briefly about CPM technique. | CO1 | 4 |
| **(OR)** | | | | |
| 4. | a. | The normal cost and duration, crash cost and duration of activities of a project are given in the table. If the overhead cost is Rs.45 per day, determine the optimal cost schedule for the project by drawing the project schedule vs total cost.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Activity** | **Normal** | | **Crash** | | | Cost | Duration | Cost | Duration | | 1-2 | 360 | 3 | 440 | 1 | | 2-3 | 240 | 4 | 320 | 2 | | 2-4 | 100 | 7 | 140 | 3 | | 3-4 | 80 | 5 | 140 | 2 | | CO1 | 16 |
|  | b. | Explain briefly the various terminologies in PERT. | CO2 | 4 |
|  |  |  |  |  |
| 5. | a. | The demand per day for a belt used in the engine of an automobile has the following probability distribution. Simulate the demand for 20 days.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Demand/day** | 3 | 4 | 5 | 6 | 7 | | **Probability** | 0.10 | 0.30 | 0.30 | 0.20 | 0.10 | | CO2 | 10 |
|  | b. | In a big manufacturing company, raw materials are received from various vendors. The transport of these  Raw materials are done using trucks. Before the raw materials are sent to the stores, they are to be inspected. The inspector takes 6 minutes for inspecting a truck and he can inspect only one truck at a time. Once the truck is inspected, it is sent to the stores .  The following data is available   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Inter arrival time of truck(minutes) | 2 | 3 | 4 | 5 | 6 | 8 | 11 | 12 | 14 | | Frequency | 3 | 6 | 9 | 18 | 20 | 19 | 10 | 8 | 7 |   Using the Montecarlo simulation, determine the following using the following 15 random numbers  23,89,27,86,10,38,59,43,17,81,36,43,76,84 and 56 for inter arrival time of the truck   1. Average waiting time of the inspector 2. Average waiting time of truck | CO2 | 10 |
| **(OR)** | | | | |
| 6. | a. | In a big textile mill, trucks loaded with raw cotton arrive at a rate of 12 trucks per day. Assume that the inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average 34 minutes. Determine the following:  i) Mean line length  ii) Probability that the queue size exceeds 12 | CO2 | 10 |
|  | b. | In a medium scale industry, a tool and cutter grinder operator finds that the time spent on each tool has an exponential distribution with mean of 25 minutes. If he grind the tools the order in which they come in and arrival of tools is approximately Poisson with an average rate of 11 per 8 hours day,  i) What is the operators expected idle time each day?  ii) Average number of tools in the system  iii) Average waiting time of a tool in a queue | CO2 | 10 |
|  |  |  |  |  |
| 7. | a. | Solve the following game by graphical method  Player B   |  |  |  | | --- | --- | --- | | 1 | 3 | 11 | | 8 | 5 | 2 |   Player A | CO3 | 16 |
|  | b. | Solve the following game by arithmetic method (2)  Player B   |  |  | | --- | --- | | 2 | 5 | | 3 | -3 |   Player A | CO3 | 4 |
| **(OR)** | | | | |
| 8. | a. | Solve the following game whose pay off matrix is given below by concept of dominance  **Player A**     |  |  |  |  | | --- | --- | --- | --- | | 3 | 2 | 4 | 0 | | 2 | 4 | 2 | 4 | | 4 | 2 | 4 | 0 | | 0 | 4 | 0 | 8 |   Player B | CO3 | 16 |
|  | b. | What is the criteria to solve game theory by graphical method? | CO3 | 4 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. | a. | The owner of a stone crushing machine determines fom his past records that the cost per year for operating the machine is as shown in the table. The purchase price of this machine was Rs.65000 when new.   |  |  |  |  | | --- | --- | --- | --- | | **Age** | 1 | 2 | 3 | | **Operating**  **cost**  **in Rs** | 10,000 | 12,000 | 14,000 |   After 3 years, the operating cost is Rs.4000 B, where B=4,5,6 (B indicating age in years). If the resale value decrease by 15 percent of the purchase price every year, what is the optimal replacement policy? | CO3 | 20 |